

# Full-Depth Reclamation (FDR)

## More INDOT Perspectives, Lessons Learned & Future

David Holtz, P.E., INDOT

Dave Butts, P.E., INDOT

2017 Purdue Road School

March 2017



# Agenda

- INDOT
- Brief INDOT FDR History
- INDOT FDR Pavement Situation Update
- Lessons Learned & Specification Changes
- Future of INDOT FDR



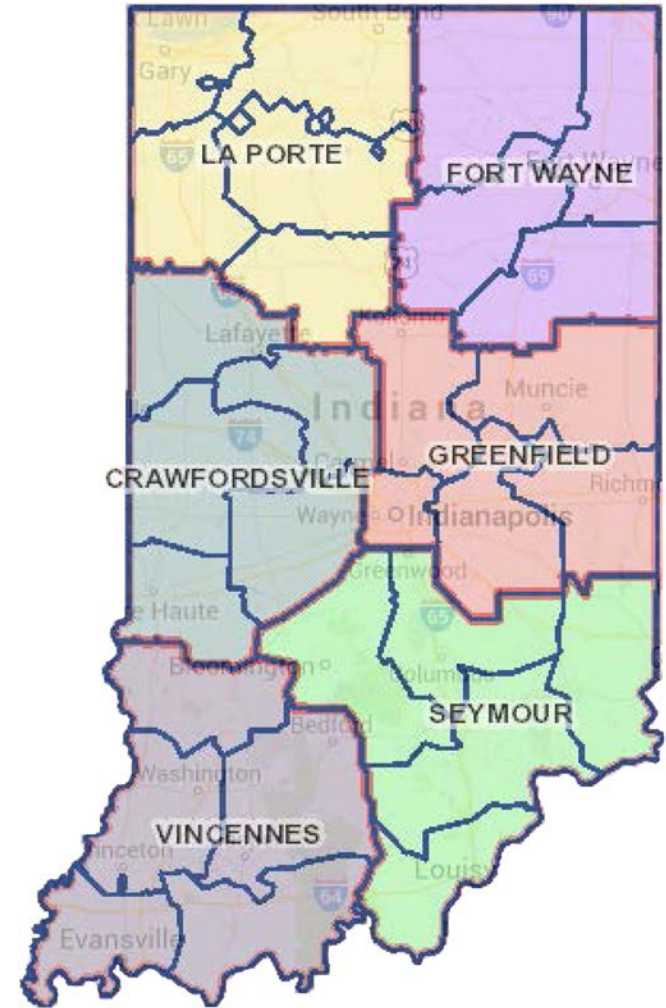
# INDOT Mission

**INDOT will plan, build, maintain and operate a superior transportation system enhancing safety, mobility, and economic growth.**



# INDOT Profile

- Six district offices
- Over 3,500 employees
- \$1 billion/annual capital expenditures
- 28,400 total roadway lane miles
- Over 5000 INDOT-owned bridges
- Assists 42 railroads in planning & development of more than 3,880 miles of active rail lines
- Supports 69 Indiana State Aviation System Plan airports



# INDOT VALUES



## The Value of Values

- 1. Respect** — Treat others fairly. Value the individual skills, experience, diversity and contributions of fellow employees.
- 2. Teamwork** — Share information and seek input from co-workers and agency partners to achieve goals.
- 3. Accountability** — Take personal responsibility for actions and decisions.
- 4. Excellence** — Provide exceptional customer service through individual initiative, innovation and delivery of quality results.

Values are the core behaviors that all employees, as an organization, will support, promote and exhibit to achieve agency goals.



# Very Brief INDOT FDR History

- SR 38, E of Dayton, IN
- SR 1, NW of Portland, IN
- SR 1, W of Winchester, IN
- SR 227, NW of Richmond, IN
- SR 26, W of Portland, IN



# Very Brief INDOT FDR History

- SR 59, Waveland, IN
- SR 236, Waveland, IN
- I-74 (shoulder), vic Crawfordsville, IN

## Future Projects

- SR 244, Rush Co
- SR 327, Fort Wayne N of Fort Wayne, IN



# FDR Pavement Situation Update

- 11,577 Center-Line miles
- 27,000 (+/-) Lane-miles
- Approx 8200 miles of 2-lane roads
- NLT 5200 miles of roads with less than 2000 vehicles/day/lane
- Full reconstruction very expensive
- 8 FDR Projects to-date
- FDR proving effective alternative selectively





# Lessons Learned & Specification Changes

- Supplemental aggregate types & quantities vs. low bid generated challenges-NEW SPEC
- FDR shoulder performed well w/MOT traffic loads-DESIGN & NEW SPEC
- Improve & refine technological approach and bidding approach-NEW SPEC



# Lessons Learned & Specification Changes

- 413-R-634, FULL DEPTH RECLAMATION, FDR  
dtd 09-01-16
- Quality Control Plan
  - Reclamation Base Course mix design
  - Start to finish process description
  - Corrective action measures & supplemental material
  - List of proposed equipment
  - List of proposed QC tests & testing frequencies
  - Curing methods
  - Stabilization process applied to the RBC or subgrade after a failed proofroll



# Lessons Learned & Specification Changes

- Materials
  - AE or PC, etc.
- Mix Design
- Construction Requirements
  - Site Issues, e.g., RPM, organics,
  - Equipment
    - Spreaders & distributors
    - AE or PC storage & supply equipment
    - Mixing-reclaiming equipment
    - Motor grader, rollers, water trucks
  - Weather Restrictions
  - Pulverization



# Lessons Learned & Specification Changes

- Control strip & compaction
  - Deep compaction issues
    - Max 10 inch layer thickness, may change, maybe 9 in future?
- Curing
- Proofrolling
- Underdrain installation
- RBC Overlay
- MOT
  - Construction access
  - Windows and timing



# Lessons Learned & Specification Changes

- FDR processed materials mix ultimate strength has changed, may be customized in future
- Portland Cement vs. Asphalt Emulsion
  - Unique soils will determine stabilization material
- Will have two different specification subsections eventually



# Lessons Learned & Specification Changes

- Multiple FDR layers
  - Foundation treatment
  - 10 inch layer now maximum due to compaction
- More extensive project design support testing
- Corrective aggregate estimate in design
- Variable stabilizing agent quantities
- IDM Pavement Design Chapter to be updated



# Lessons Learned & Specification Changes

- MOT Loads
- Construction traffic loads
  - Shear and bending of bonded layers
    - Extreme fiber stress equals  $MC/I$
    - Moment of Inertia equals  $bh^3/12$
- Working towards even more full understanding by all parties



# Lessons Learned & Specification Changes

- Requires competent contractor & appropriate equipment
- INDOT will increase knowledge of potential consequences of actions relative to finished product and its life-cycle costs

We're going to get even better!





# Future of INDOT FDR

- INDOT will continue to better develop and utilize Full-Depth Reclamation
  - Lots of lessons learned already in short period of time
  - Lots of challenges still ahead
  - Appears to be best option available for some highway project situations
  - Other options will be used when better able to effectively and efficiently achieve project objective

